

CLAIMS

1. A path search method for detecting  
respective timings of path components included a  
5 signal received via a multipath propagation path,  
said method comprising the steps of:  
a first path search step for detecting  
respective timings of path components using pilot  
symbols of a known phase included in said signal  
10 received via the multipath propagation path; and  
a second path search step for detecting  
respective timings of path components using  
information symbols derived from a signal  
demodulated according to said timings detected in  
15 the first path search step and said pilot symbols of  
a known phase.
2. The path search method as claimed in  
claim 1, wherein said information symbols derived  
20 from the signal demodulated according to the timings  
detected in the first path search step are generated  
by implementing the steps of:  
despreading said signal received via the  
multipath propagation path according to said timings  
25 detected in the first path search step;  
cophasing and summing the information  
symbols despread according to said respective path  
timings in a symbol by symbol manner;  
demodulating and implementing data  
30 decision of said cophased and summed respective  
information symbols; and  
remodulating said data decision signal.
3. The path search method as claimed in  
35 claim 2, wherein said information symbols derived  
from the signal demodulated according to the timings  
detected in the first path search step are selected

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and fed back such that information symbols satisfying a predetermined condition are selected.

5           4. The path search method as claimed in claim 1, wherein said second path search step is repeated until a predetermined condition is satisfied.

10           5. The path search method as claimed in claim 1, wherein said signal received via the multipath propagation path is transmitted in accordance with a multicarrier code division multiplex system.

15           6. A channel estimation method for estimating channel variation using pilot symbols, said method comprising:  
            a pilot symbol acquiring step for acquiring pilot symbols of a known phase included in  
20           received packets; and  
            a channel estimation step for implementing channel estimation using said acquired pilot symbols.

25           7. The channel estimation method as claimed in claim 6, wherein said pilot symbols of a known phase are time-multiplexed with the packets.

30           8. The channel estimation method as claimed in claim 6, wherein said pilot symbols of a known phase are code-multiplexed with the packets.

35           9. The channel estimation method as claimed in claim 1, wherein said channel estimation step implements channel estimation by combining said pilot symbols of a known phase and pilot symbols included in other packets transmitted from the same transmission source.

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10. A channel estimation method for estimating channel variation using pilot symbols, said method comprising:

5       a pilot symbol acquiring step for acquiring pilot symbols of a known phase included in a common control channel in a multiplexed manner; and

10       a channel estimation step for implementing channel estimation using said acquired pilot symbols.

11. The channel estimation method as claimed in claim 10, wherein said pilot symbols of a known phase are time-multiplexed with the common control channel.

12. The channel estimation method as claimed in claim 10, wherein said pilot symbols of a known phase are code-multiplexed with the common control channel.

13. The channel estimation method as claimed in claim 10, wherein said channel estimation step implements channel estimation by combining said pilot symbols of a known phase and pilot symbols included in other packets transmitted from the same transmission source.

14. A channel estimation method for estimating channel variation using pilot symbols, said method comprising:

30       a first pilot symbol acquiring step for acquiring pilot symbols of a known phase included in packets and in a common control channel in a multiplexed manner;

35       a second pilot symbol acquiring step for acquiring pilot symbols of a known phase included in

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said common control channel; and

a channel estimation step for implementing channel estimation using said acquired pilot symbols.

- 5           15. A channel estimation method for estimating channel variation using pilot symbols, said method comprising:
- a pilot symbol acquiring step for acquiring pilot symbols of a known phase included in  
10 a received packet;
- a tentative channel estimation step for implementing tentative channel estimation using said acquired pilot symbols;
- a tentative data decision information  
15 symbol generating step for compensating for the channel variation in accordance with a result of said tentative channel estimation and generating tentative data decision information symbols from the compensated information symbols; and
- 20           a channel estimation step for generating information symbols wherefrom modulation components are removed using said tentative data decision information symbols and implementing channel estimation using said pilot symbols and information  
25 symbols.

16. The channel estimation method as claimed in claim 15, wherein said tentative data decision information symbol generating step includes  
30 a weighting process for weighting said tentative data decision information symbols according to the reliability.

17. The channel estimation method as  
35 claimed in claim 15, wherein said tentative data decision information symbol generating step includes an error correction process for error correction

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decoding said tentative data decision information symbols after error correction encoding again.

18. The channel estimation method as  
5 claimed in claim 17, wherein said tentative data decision information symbol generating step includes a weighting process for weighting said error correction coded tentative data decision information symbols according to the reliability.

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19. A channel estimation method for estimating channel variation using pilot symbols, said method comprising:

15 a subcarrier acquiring step for acquiring a plurality of subcarriers included in received packets;

20 a pilot symbol acquiring step for acquiring a plurality of pilot symbols of a known phase included in said plurality of subcarriers, respectively; and

a channel estimation step for implementing channel estimation for each of said subcarriers using said plurality of pilot symbols.

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20. A communication device comprising:  
path search means for detecting respective timings of path components included in a reception signal received via a multipath propagation path using pilot symbols of a known phase included in  
30 said reception signal; and

channel estimation means for estimating channel variation using said pilot symbols.

35 21. The communication device as claimed in claim 20, wherein said path search means includes:

a first path search part for detecting respective timings of path components using said

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pilot symbols; and

5 a second path search part for detecting  
respective timings of path components using an  
information symbols derived from a signal  
demodulated according to said timings detected in  
the first path search part and said pilot symbols.

10 22. The communication device as claimed in  
claim 20 or 21, wherein said channel estimation  
means includes:

a pilot symbol acquiring part for  
acquiring pilot symbols included in said reception  
signal; and

15 a channel estimation part for implementing  
channel estimation using said acquired pilot symbols.

20 23. The communication device as claimed in  
claim 22, wherein said channel estimation part  
includes:

a tentative channel estimation part for  
implementing tentative channel estimation using said  
acquired pilot symbols;

25 a tentative data decision information  
symbol generating part for compensating for the  
channel variation in accordance with a result of  
said tentative channel estimation and generating a  
tentative data decision information symbols from the  
compensated information symbols; and

30 a channel estimation part for generating  
an information symbol wherefrom modulation  
components are removed using said tentative data  
decision information symbols and implementing  
channel estimation using said pilot symbols and  
information symbols.

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24. The communication device as claimed in  
claim 22,

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wherein said pilot symbol acquiring part includes:

a subcarrier acquiring part for acquiring a plurality of subcarriers included in said reception signal; and

a pilot symbol acquiring part for acquiring a plurality of pilot symbols of a known phase included in said plurality of subcarriers, respectively, and,

wherein said channel estimation part implements channel estimation for each of said subcarriers using said plurality of pilot symbols.

25. A communication device for implementing path search for detecting respective timings of path components included a signal received via a multipath propagation path, said device comprising:

a first path search part for detecting respective timings of path components using pilot symbols of a known phase included in said signal received via the multipath propagation path; and

a second path search part for detecting respective timings of path components using an information symbols derived from a signal demodulated according to said timings detected in the first path search step and said pilot symbols of a known phase.

26. A communication device for implementing channel estimation for estimating channel variation using pilot symbols, said device comprising:

a pilot symbol acquiring part for acquiring pilot symbols of a known phase included in received packets; and

a channel estimation part for implementing

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channel estimation using said acquired pilot symbols.

27. A communication device for  
implementing channel estimation for estimating  
5 channel variation using pilot symbols, said device  
comprising:  
a pilot symbol acquiring part for  
acquiring pilot symbols of a known phase included in  
a common control channel in a multiplexed manner;  
10 and  
a channel estimation part for implementing  
channel estimation using said acquired pilot symbols.

28. A communication device for  
15 implementing channel estimation for estimating  
channel variation using pilot symbols, said device  
comprising:  
a first pilot symbol acquiring part for  
acquiring pilot symbols of a known phase included in  
20 packets and in a common control channel in a  
multiplexed manner;  
a second pilot symbol acquiring part for  
acquiring pilot symbols of a known phase included in  
said common control channel; and  
25 a channel estimation part for implementing  
channel estimation using said acquired pilot symbols.

29. A communication device for  
implementing channel estimation for estimating  
30 channel variation using pilot symbols, said device  
comprising:  
a pilot symbol acquiring part for  
acquiring pilot symbols of a known phase included in  
received packets;  
35 a tentative channel estimation part for  
implementing tentative channel estimation using said  
acquired pilot symbols;

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a tentative data decision information symbol generating part for compensating for the channel variation in accordance with a result of said tentative channel estimation and generating a  
5 tentative data decision information symbols from the compensated information symbols; and

a channel estimation part for generating information symbols wherefrom modulation components are removed using said tentative data decision  
10 information symbols and implementing channel estimation using said pilot symbols and information symbols.

30. A communication device for  
15 implementing channel estimation for estimating channel variation using pilot symbols, said device comprising:

a subcarrier acquiring part for acquiring a plurality of subcarriers included in received  
20 packets;

a pilot symbol acquiring part for acquiring a plurality of pilot symbols of known phases included in said plurality of subcarriers, respectively; and

25 a channel estimation part for implementing channel estimation for each of said subcarriers using said plurality of pilot symbols.

31. A communication device comprising:  
30 path search means for performing a first path search step in which respective timings of path components are detected using pilot symbols of a known phase included in a reception signal received via a multipath propagation path; and

35 channel estimation means for performing a first channel estimation step in which channel estimation is implemented for estimating channel

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variation after said first path search step,  
wherein said path search means implements  
a second path search step in which respective  
timings of path components are detected using  
5 information symbols derived from a signal  
demodulated after said first channel estimation step  
according to said timings detected in the first path  
search step and said pilot symbols of a known phase,  
and

10 wherein said channel estimation means  
implements a second channel estimation step in which  
channel estimation is implemented for estimating  
channel variation using information symbols derived  
from a signal demodulated after said first channel  
15 estimation step according to said timings detected  
in the second path search step and said pilot  
symbols of a known phase, and thereafter,  
recursively implementing path search and channel  
estimation by repeating the processes of  
20 implementing said second path search step using said  
information symbols demodulated after said second  
channel estimation step and pilot symbols and  
implementing said second channel estimation step  
using information symbols fed back in accordance  
25 with the timing detected in said second path search  
step and pilot symbols.

32. The communication device as claimed in  
claim 31, wherein said pilot symbols are included in  
30 at least one of packets and a common control channel  
of said received signal.

33. The communication device as claimed in  
claim 32, wherein said pilot symbols are multiplexed  
35 with at least one of said packets and said common  
control channel.

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34. A communication device comprising path search and channel estimation means for implementing at least one of path search and channel estimation using pilot symbols of a known phase or information symbols included in at least one of packets and a common control channel of a received signal.

35. The communication device as claimed in claim 34, wherein said pilot symbols are included in at least one of packets and a common control channel of said received signal.

36. The communication device as claimed in claim 34 or 35, further comprising feedback means for feeding back said information symbol, wherein said path search and channel estimation means recursively implements path search and channel estimation by repeating processes of implementing path search using information symbols decoded after channel estimation and pilot symbols and implementing channel estimation using information symbols fed back via said feedback means in accordance with a timing detected in said path search and pilot symbols.

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